TITLE

Transporting Ad Characterization Vector

Background of the Invention

Advertising forms an important part of broadcast programming including broadcast video (television), radio and printed media. The revenues generated from advertisers subsidize and in some cases pay entirely for programming received by subscribers. For example, over the air broadcast programming (non-cable television) is provided entirely free to viewers and is essentially paid for by the advertisements placed in the shows that are watched. Even in cable television systems and satellite-based systems, the revenues from advertisements subsidize the cost of the programming, and were it not for advertisements, the monthly subscription rates for cable television would be many times higher than at present. Radio similarly offers free programming based on payments for advertising. The low cost of newspapers and magazines is based on the subsidization of the cost of reporting, printing and distribution from the advertising revenues.

Techniques for inserting pre-recorded spot messages into broadcast transmission have been known. Generally, broadcast video sources (i.e., TV networks, special interest channels, etc.) schedule their air time with two types of information: "programming" for the purpose of informing or entertaining, and "avails" for the purpose of advertising. The avails may occupy roughly 20-25% of the total transmitting time, and are usually divided into intervals of 15, 30, or 60 seconds.

In many prior art systems, the insertion of advertisements in avails is handled by a combination of cue-tone detectors, switching equipment and tape players which hold the advertising

material. Upon receipt of the cue tones, an insertion controller automatically turns on a tape player containing the advertisement. Switching equipment then switches the system output from the video and audio signals received from the programming source to the output of the tape player. The tape player remains on for the duration of the advertising, after which the insertion controller causes the switching equipment to switch back to the video and audio channels of the programming source. When switched, these successive program and advertising segments usually feed to a radio-frequency (RF) modulator for delivery to the subscribers.

Many subscriber television systems, such as cable television are currently being converted to digital equipment. These new digital systems compress the advertising data according to decompression standards, such as a Motion Picture Experts Group (MPEG) compression standard (currently MPEG-2 standard). The compressed data is then stored as a digital file on a large disk drive (or several drives). Upon receipt of the cue tone, the digital file is spooled ("played") off of the drive to a decompressor. The video and accompanying audio data are decompressed back to standard video and audio, and switched into the video/audio feed of the RF modulator for delivery to the subscriber.

A prior art (present model) of providing advertisements along with actual programming is based on linked sponsorship. In the linked sponsorship model, the advertisements are inserted into the actual programming based on demographic information related to the viewers/subscribers. However, the ability to transmit information digitally allows programming and advertisements to be transported from various geographic locations and arranged in a fashion which permits an optimized program to be presented to a subscriber.

Furthermore, the transition to the digital age permits a migration to new methods of advertising based on what is termed orthogonal sponsorship. In orthogonal sponsorship, the advertisements are targeted at subscribers based on a determination that the advertisement will be of interest to the subscriber and that the subscriber is likely to ultimately purchase the product or service being advertised.

The digital systems are capable of handling both linked sponsorship, orthogonal sponsorship and a combination of both. However, what is required is a method and apparatus for characterizing advertisements and making such characterizations available to various points in the network including the head-end and the subscriber side, whereby different advertisements are selected based on the likes/preferences of the subscriber.

Summary of the Invention

In accordance with the principles of the present invention, an apparatus and method for creating one or more ad characterization vectors and for transporting the ad characterization vectors are provided. Each ad characterization vector characterizes the corresponding advertisement and may include essential information such as: duration of the advertisement, bandwidth requirements of the advertisement, target audience, etc.

In one embodiment, the ad characterization vector is transported within the MPEG layer as a separate data service. In this embodiment, the ad characterization vector may be encoded along with program audio, video contents, and may travel within a single MPEG transport layer. In another embodiment, the ad characterization vector is transported within the vertical blanking interval (VBI) along with closed-captioning data, e.g., in line 21, field 2.

At the receiver end, the ad characterization vector may be decoded by a decoding device, e.g., a set-top device. At the set-top device, the ad characterization vector may be utilized to determine which ads are suitable for that set-top. For example, the ad characterization vectors may carry identifiable information to be used by the set-top to determine whether the incoming advertisement should be accepted or not.

The ad characterization vector may also be received by head-end equipment which utilizes the information as part of an ad-matching process.

The ad characterization vector may also be used by the set-top device to selectively download advertisements to the hard drive of the set-top device. These advertisements may be later inserted in the program streams for display to the subscriber.

In another embodiment, the ad characterization vector may be used to match advertisements to the subscribers. It is envisioned that with the use of current technology, the set-tops may be configured to store subscriber profiles. The information of the subscriber profiles may be utilized to select appropriate advertisements. Alternatively, the set-tops may accumulate raw subscriber selection data, e.g., channel changes and volume changes, etc. and process the subscriber selection data to create a subscriber profile. In this embodiment, a plurality of advertisements may be transmitted to a subscriber end via an ad channel, wherein each advertisement is characterized by an ad characterization vector. At the subscriber end, the information from the ad characterization vector may be used to match advertisements to the subscriber profiles, whereby the set-top device downloads only suitable advertisements from the ad channel.

Similarly, the ad characterization vectors may be used to substitute default advertisements in the program streams with

targeted advertisements suited for subscriber preferences (based on subscriber profiles).

Brief Description of the Drawings

The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and, together with the description serve to explain the principles of the invention.

In the drawings:

FIG. 1 illustrates the generation of an ad characterization vector as an additional data service in an MPEG stream;

FIG. 2 illustrates different data fields of a typical MPEG stream;

FIG. 3 illustrates the use of a program clock reference for the creation of a 27-MHz clock to be used in an ad characterization vector;

FIG.4 is a table depicting different packet identification codes;

FIG. 5 is a schematic diagram illustrating an interlaced raster scanning pattern of a conventional television;

FIG. 6 illustrates an exemplary case of utilizing avail opportunities in conjunction with correlation data to match the advertisements;

FIG. 7 is a functional block diagram of a television video and data transmission system;

FIG. 8 is a timing diagram showing the vertical blanking interval (VBI) lines of field 1 and field 2;

FIG. 9 is a timing diagram of the standard data format (1X) for transmitting data in the VBI;

FIG. 10 is a timing diagram of the accelerated data format (2X) for transmitting data in the VBI;

FIG. 11A is a functional block diagram of a television including a vertical blanking interval slicer and decoder;

FIG. 11B is a functional block diagram of a video cassette recorder or appliance including a vertical blanking interval slicer and decoder;

FIG. 12 illustrates the transport of the ad characterization vector via an ad channel; and

FIG. 13 illustrates the dynamic substitution of advertisements based on ad characterization data.

Detailed Description

In describing a preferred embodiment of the invention illustrated in the drawings, specific terminology will be used for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

With reference to the drawings, in general, and in FIGS. 1 through 13 in particular, the method and system of the present invention is disclosed.

Generally, in accordance with the principles of the present invention, different advertisements to be transmitted by network operators in one or more entertainment programs are characterized with reference to a few pre-determined parameters. For example, advertisers provide to the network operators, key

characterization data regarding the advertisement and target market in a pre-determined data format. The information provided by the advertisers may be used to characterize the advertisements and form ad characterization vectors.

The principles of the present invention are flexible and different systems/applications may use different parameters. The choices for these parameters may be presented as pull down selections in a browser utilizing a graphical interface. In an exemplary case, the following categories may be used:

Advertisement duration: 10s; 15s; 30s; 60s

Minimum advertisement bandwidth: 2 Mb/s, 4Mb/s, 6Mb/s, 8Mb/s, 10Mb/s

Household Income: <$30K, $31K-$50K, $51K-$75K, $76K-$100K, >$100K, no preference

Household size: 1, 2, 3-4, 4-6, >6, no preference

Median household age: <25, 25-35, 36-45, 46-55, >56, no preference

Ethnic group: Caucasian, African American, Hispanic, Asian-Pacific, no preference

These categories may be further assigned weights and a weighted average may be utilized to form an ad characterization vector.

In one implementation, when "no preference" is chosen, equal weighting is given to each category within the particular demographic parameter. For example, if no preference is selected for household income, all categories within the household income demographic are assigned a value of 0.2 (1 divided by the number of choices, which in this case is 5). After weights have been assigned to all the categories, one or more ad characterization vectors may be generated based on weighted categories. These ad

characterization vectors assist in characterization of various advertisements. Other categories based on demographic factors, socio-economic factors, and consumption factors (purchase information) may also be used.

Once the ad characterization vectors have been formed, they may be transported to the head-end subscriber side, or other parts of the network by utilizing one of the following described techniques.

In one embodiment, for digital cable-based systems, the ad characterization vector may be encoded and transported as a separate data service, e.g., encoded data packet stream. The ad characterization vector may be synchronized with actual advertisements, uniquely identified and carried as a separate data service within the MPEG video/audio layer.

FIG. 1 illustrates how the ad characterization vector may be added as a data service to an MPEG stream via the use of encoders, packetizers, and a multiplexer 105. In this embodiment, video contents are encoded by a video encoder 101 and then packetized by a packetizer 103. Similarly, the audio contents are encoded by an audio encoder 107, and then packetized by a packetizer 109. Subsequently, audio packets, video packets and the contents of the ad characterization vector are forwarded to the multiplexer (the contents of the ad characterization vector is data). The multiplexer 105 multiplexes the ad characterization vector with video and audio packets to create a multiplexed MPEG stream.

Generally, each of the video, audio, or data packets are transmitted as elementary streams. The elementary streams can be further broken into convenient-sized data blocks in a Packetized Elementary Stream (PES). These data blocks need header information to identify the start of the packets and must include time stamps because packetizing disrupts the time axis.

FIG. 2 illustrates different data fields of a typical MPEG stream. In accordance with the principles of the present invention, each packet is preceded by a PES packet header. Generally, the packet begins with a start code prefix of 24 bits and a stream ID that identifies the contents of the packet as video, audio, or data and further specifies the type of audio coding. These two parameters (start code prefix and stream ID) comprise the packet start code that identifies the beginning of a packet.

Generally, the transport stream carries many different programs and each uses a different compression factor and a bit rate that can change dynamically. This is generally accomplished by statistical multiplexing, wherein each program may borrow bandwidth from another program handling easy material. Each video PES may have a different number of data PESs including the data of the ad characterization vector associated with it.

Once the ad characterization vector is embedded in the PES as a separate data service, it is usually transported as a transport stream in the transport layer. The transport layer converts the PES data into small packets of a constant size that are self contained. If there is any jitter in the timing at the decoder, known time division multiplexing techniques may be used.

As previously noted, the principles of the present invention are flexible. Thus, each transport stream may carry many different programs and each may use a different compression factor and a bit rate that may change dynamically even though the overall bit rate stays constant.

The ad characterization vector may be originated by separate equipment and later added as a program in a transport stream. The ad characterization vector may be synchronized by utilizing a system clock (an external clock). Alternatively, each transport stream may require its own means (separate clock), generally

known as a program clock reference (PCR). The PCR may recreate a stable reference clock that can be divided down to create a time line at the decoder so that the time stamps for the ad characterization vector match the other programs in the transport stream.

FIG. 3 illustrates how a PCR may be used to recreate a remote version of the 27-MHz clock for an ad characterization vector. In this embodiment, the video encoder 301 drives a 27-MHz clock 303 at a constantly running binary counter 305, and the values of these counters are sampled periodically and placed in the header adaptation fields as the PCR. Each encoder 301 may produce packets having a different Packed Identification (PID). The transport stream decoder 307 recognizes the packets with the correct PID for selected programs and ignores others. At the decoder end, a VCO 309 generates a nominal 27-MHz clock 311 and this drives a local PCR counter. The local PCR is compared via a comparator 315 with the PCR from the packet header and the difference is the PCR phase error. This error is filtered via low-pass filter 317 to control the VCO that brings the local PCR count into step with the header PCRs. Heavy VCO filtering ensures that the jitter in the PCR transmission does not modulate the clock. The output of the system is a receiver 27-MHz clock 325 that may be used by one of the existing MPEG systems.

Thus, the ad characterization vector within a transport stream is a multiplex of PES packets. At the receiver end, these packets (having appropriate time stamps) are sufficient to recreate the clock for each program at the decoder. At the receiver end, the packets of ad characterization vectors are recognized by an associated PID, wherein the PID is a 13-bit field in the transport packet header containing information of packet identities.

The packets associated with a particular ad characterization vector will have the same PIDs. Packets associated with other streams within the same transport stream will have different PIDs. A demultiplexer at the receiver end may select data for an entire program by selecting appropriate PIDs for video, audio and data, and then identifying and associating packets to various programs. The demultiplexer can do this task only if it knows what the right PIDs are. In the present invention, this is accomplished by Program Specific Information (PSI). The PSI is also carried in packets having unique PIDs, some of which are standardized (in accordance with the MPEG standard).

Generally, the packets are specified by a Program Association Table (PAT) and a Conditional Access Table (CAT). These packets must be included periodically in every transport stream. The PAT generally has a PID of 0, and the CAT generally has a PID of 1. These values and the null packet PID of 8191 are the only fixed PIDs, and the demultiplexer determines all the remaining PIDs by accessing the appropriate table.

The ad characterization vector may be listed in the program association table along with the program stream. As shown in FIG. 4, the PIDs of the video, audio, and data elementary streams that belong in the same program stream are listed in the Program Map Table (PMT) packets. The ad characterization vector is also listed in the PMT table. Other similar tables (not shown) may also be used to accomplish the same purpose.

Generally, a network information table (NIT) contains details of more than just the transport stream carrying it. Also included are details of other transport streams that may be available to the same decoder, for example, by tuning to a different RF channel or steering a dish to a different satellite. The NIT may list a number of other transport streams, and each

one may have a descriptor that specifies the radio frequency, orbital position and so on.

Upon first receiving a transport stream, the demultiplexer looks for PID 0 and 1 in the packet headers. All PID 0 packets contain the PAT, and all PID 1 packets contain CAT. By reading the PAT, the demux may find the PIDs of the ad characterization vector. Consequently, if the decoding of the ad characterization vector is required, reference to the PAT and then the PMT is all that is needed to find the PIDs of all the packets associated with the ad characterization vector.

The above mentioned embodiment is particularly useful for the digital-based cable system. In another embodiment, apparatus and methods are provided for inserting an ad characterization vector into a vertical blanking interval (VBI) line of video frames. These apparatus and methods are particularly useful for analog-based systems. It is to be noted that the addition of the ad characterization vector does not alter the master programming. The ad characterization vector is inserted into the VBI through a process called encoding, during which a copy of the master programming is created, and the video/audio frames are routed through an encoder. Also routed through the encoder is a data signal from a personal computer or a disk reader that contains the ad characterization vector may come from a data file created prior to the encoding process). The ad characterization vector may be encoded on data lines 1 to 21, but the preferred medium is line 21 field 2, along with closed-captioning data on line 21, field 1.

The newly encoded ad characterization vector, along with the closed-caption data now on line 21 (field 1), may then be routed to a record machine. Thus, the encoding is a dubbing process. It is preferred that the ad characterization vector is not placed on line 21 of the master programming. Theoretically, ad

characterization data may be added to the digital master using the write-back feature. In a preferred embodiment of the present invention, the ad characterization vector is added as a dub or clone of the original master data.

At the receiving end, the ad characterization vector may be decoded by the use of a decoding device, e.g., by a set-top device., or other decoding equipment in the network It should be noted that no special equipment is needed to transmit or decode the ad characterization vector. Any broadcaster or cable operator that carries closed-captioning may carry the ad characterization vector. In fact, in modern equipment where everything is correctly adjusted, the ad characterization vector may be transmitted without even explicit knowledge of the broadcaster or cable operator.

FIG. 5 illustrates a block diagram of a VBI encoder that may be used to generate one or more ad characterization vectors. As shown in FIG. 5, the ad characterization vector is generated by an ad characterization vector processor 501. As previously described, the ad characterization vector may include key parameters about ad duration, bandwidth requirements, and target audience. The ad characterization vector is then forwarded to a micro-computer 503 via an RS-232 serial port. The output of the micro-computer 503 is fed to a digital sync processor 505, a waveform generator 507, and a digital-to-analog converter 509. The digital sync processor 505 syncs the ad characterization vector by utilizing a data clock 511 to generate a sync signal and a data clock, which are forwarded to the waveform generator 507.

The output of the waveform generator 507 is fed to the digital-to-analog converter 509 which outputs analog data (ad characterization vector) to an inserter 515. The inserter 515 also receives video input from a first amplifier 517 and the

output the waveform from waveform generator 507, and in return, generates an appropriate output that is fed to a second amplifier 519. The output from the amplifier 519 is the desired output having video contents of the ad characterization vector.

It is to be noted that generally, video images in a cathode ray tube (CRT) type-video device, e.g., a television, are generated by scanning a beam along a predefined pattern of lines across a screen. Each time all the lines are scanned, a frame is said to have been produced. In one implementation, such as that used in the United States, a frame is scanned 30 times per second. Each television frame comprises 525 lines which are divided into two separate fields, referred to as field 1 ("odd field") and field 2 ("even field"), of 262.5 lines each. Accordingly, these even and odd fields are transmitted alternately at 60 Hz. The lines of the even and odd fields are interleaved to produce the full 525 line frame once every 1/30 of a second in a process known as interlacing. Another standard, uses 625 lines of information and interlaces 312 and 313 lines at 50 fields per second. In the 525 line standard used in the United States, approximately 480 lines are displayed on the television screen.

FIG. 6 is a schematic diagram illustrating the interlaced scanning pattern 100 on a screen of a conventional television receiver. A video display scans the beam from the top left hand corner and scans across the screen (line 22, field 1). After it finishes scanning the first line, the beam returns to the left hand side during a period known as a horizontal blanking interval and repeats scanning along another line which is parallel to but lower than the previous line (line 23, field 1). The scanning continues along the lines until the beam reaches the center of the bottom part of the screen (line 263, field 1) to complete field 1, which is comprised of lines 102.

From the bottom center of the screen, the beam returns to the top where it starts scanning from substantially the center of the screen along the lines 104 for field 2 which interlaces the lines of field 1. This is not an instantaneous bottom to top jump but actually requires the length of time to scan 21 horizontal lines. These lines 106 are lines 1 through 21 of field 2. The second half of line 21 field two (line 284) is displayed. Then lines 285 to 525 of field 2 are scanned to complete field 2. When the beam reaches the bottom, right hand corner of the screen, the picture frame is formed. Then the beam retraces to the top and the VBI lines 108 are numbered 1 through 21 of field 1. In the NTSC protocol widely used in North America, each field contains 262.5 horizontal lines and a pair of fields constitutes a single 525 line video frame and creates one video picture at one instant in time on the video display.

During the time in which the beam returns from the bottom to the top of the screen between the fields, it carries no video or picture signals because it does not produce any picture element on the screen. This time interval is generally known as the VBI. Its duration is typically 21 times the time duration that it takes the beam to scan across the screen. In other words, the duration of the VBI is equal to the time for the beam to scan 21 lines and is divided into 21 lines. In interlaced scanning, the VBI is identified by the field with which it is associated. Apparatus and methods using the NTSC standard with 21 lines in each VBI are well known in the art and therefore are not discussed in detail herein.

Because no image is produced on the display during the VBI, no picture information therefore needs to be carried by the broadcast signals. Thus, the VBI is used for conveying auxiliary information from a television network or station to an audience. For example, closed-caption data associated with the television

program are transmitted as encoded composite data signals in VBI line 21, field 1 and field 2 of the standard NTSC video signal.

Lines 1 through 9 of the VBI of each field are used for vertical synchronization and post equalizing pulses. Thus, lines 10 through 21 are available for the transport of the ad characterization vectors.

FIG. 7 is a functional block diagram of a data transmission system. As used herein, the terms "broadcast" and "transmit" are used interchangeably for the transmission of signals, including signals carrying the ad characterization vector over cable or fiber optics, to or from satellites, over the air, and the like. A network head end 10001 transmits a composite television signal containing inserted information in a portion thereof, typically the VBI (described above in conjunction with FIG. 6), to a satellite 10002 which rebroadcasts the same to a local affiliate 10003. The affiliate 10003 may further insert data into the VBI of the received television signal and transmit the same to a local cable head end 10004. The local cable head end 10004 receives television signals from a plurality of sources (including satellites) and may further insert data into the VBI of any of the television signals. The signals from the plurality of sources are combined into a composite television signal, amplified, and provided over a cable to a plurality of individual subscribers 10005. In addition, the individual subscribers 10005 may receive signals directly from the local affiliate 10003 by air, which may include the use of a satellite 10002, or by cable.

More specifically, the network head end 10001 has a video tape recorder (VTR) 10006 for providing a program signal to an inserter 10007. A controller 10008 controls the scheduling of loading tapes from a cart (a machine with a plurality of video tape cassettes which are moved by a robotic arm from a storage location and inserted into a video tape recorder and vice versa).

Furthermore, the controller 10008 controls the lighting of stages during live broadcasts, such as news broadcasts. The controller 10008 is typically a microprocessor based system. A traffic computer 10009 controls the exact timing of playing individual segments of video tapes and inserting commercials therebetween as well as switching between different programs. Some network head ends 10001 have both a traffic computer 10009 and a controller 10008. The controller 10008 provides data and commands to the inserter 10007. The traffic computer 10009 provides data and commands to the controller 10008, if present. Otherwise, the traffic computer 10009 provides these signals directly to the inserter 10007. The inserter 10007 inserts data into the VBI of the composite television signal, as will be described below, and provides the television signal to a transmitter 10010 which in turn provides the television signal on a microwave carrier to a satellite dish 10011 for transmission to the satellite 10002.

The satellite 10002 retransmits the received signal, which is received by a satellite dish 10012 at the affiliate 10003. The dish 10012 provides the signal to a station inserter 10013 at the local affiliate 10003. The affiliate 10007 may also insert data into the composite television signal as will be described below. The television signal is then provided to a transmitter 10014 and then to a transmitting antenna 10015.

A local cable operator 10004 has a plurality of satellite dishes 10016 and antennas 10017 for receiving signals from a plurality of networks 10001 and affiliates 10003. The received signal from each of the dishes 10016 and antennas 10017 is provided to a respective input of a multi-channel inserter 10018, which can input data into the VBI of a received signal. The multi-channel output from the inserter 10018 is amplified in an amplifier 10019 and provided over a cable 10020 to individual subscribers 10005. Alternately, the subscribers or users 10005

could receive broadcast information via antennas or satellite receivers.

A VBI slicer and closed-caption decoder in a properly equipped television, VCR, or other equipment at each receiver 10005 scans VBI lines 10-21 of both fields 1 and 2. In addition, it is possible to use the first few visible lines in each video frame for VBI data, for example, lines 22-24. Lines 1 through 9 are typically used for vertical synchronization and equalization and, thus, are not used to transmit data. Closed-captioning and text mode data are generally transmitted VBI line 21, field 1 of the standard NTSC video signal, at a rate of 2 bytes for each VBI line 21, field 1, as shown by closed-caption data 112 in FIG. 8. The text mode fields fill the entire screen with text. The default mode is an open ended mode in which the page is first filled up and then scrolled up. The individual recipient of such data has no control over the data. The ad characterization vector can be transmitted on VBI line 21, field 2, as shown by data field 116 in FIG. 8 at a rate of 2 bytes per VBI line 21, field 2.

By way of background, the data in the VBI can be described in terms of the wave form, its coding and the data packet. The closed-caption data wave form has a clock run-in followed by a frame code, followed by the data. The coding of the data is non-return-to-zero (NRZ) 7 bit odd parity.

In accordance with the principles of the present invention and the principles of the extended data services proposed in the Recommended Practice for Line 21 Data Service, Electronics Industries Association, EIA-608 (drafts Oct. 12, 1992 and Jun. 17, 1993) (hereinafter referred to as "EIA-608" standard"), the subject matter of which is incorporated herein by reference, the ad characterization vector is provided in line 21, field 2 of the VBI. This recommended practice includes two closed-captioning

fields, two text mode fields and the extended data services. The data inserted into the television signal by the inserter includes closed-captioning data and the ad characterization vector. For example, the ad characterization vector may be inserted into line 20 of field 2, as shown by data 114 in FIG. 8. The data may be inserted into the VBI at the closed-caption rate (1X format) or at two times the closed-caption rate (2X format), which is further explained below.

Data, such as program identification, program related information, or the channel specific program guide (i.e., the program descriptions of the programs yet to be broadcast) may be manually entered from a local terminal 10021. The local terminal 10021 may be used to pre-build, recall, or edit messages. The terminal 10021 typically includes a computer. In addition, a modem 10022 may be used to provide data to the inserter 10007. Such data (the program identification, program related information or the channel specific program guide) may be provided manually or automatically from remote sites, such as a television program guide publisher or the network head end. The output of the inserter 10007 is a composite television signal with the data inserted. This system processes both teletext data (which is not related to the program) and auxiliary information (which is related to the program).

The timing of video signals in NTSC format is well known in the art. As described above, the VBI is the time between the flyback from the bottom of the screen to the top of the screen. Although no video signal is displayed, the horizontal synchronization pulses are still provided during the VBI. The standard data transmission rate is defined in the EIA-608 standard.

As shown in FIG. 9, the horizontal synchronization pulse 120 is followed by color burst signals 122. For the ad

characterization vector, a clock run-in cycle 124 follows the color burst which in turn is followed by a frame code 126. The clock run-in 124 is "10101010101." The frame code 126 is "01000011." Two data bytes 128 and 130 are transmitted in each VBI line. Each byte is 8 bits including a parity bit. This format is referred to as the standard data rate format (or 1X format). Each byte in the VBI line is arranged with the least significant byte first. The last bit is used as parity for error checking. Each byte of the transmitted data is parity checked upon receipt. The 1X format is the format used to transmit closed-captions in VBI line 21 field 1, as shown by closed-caption data 112 in FIG. 8. It is also the format used to transmit the ad characterization vector in VBI line 21 field 2, as shown by ad characterization data 116 in FIG. 8.

An accelerated data format (2X format) as shown in FIG. 10 uses a bit rate twice that of the 1X format to thereby provide 4 bytes per VBI line. The clock run-in 144 is the bit sequence "10101010." The frame code 146 is "10011101101." Four data bytes 148, 150, 152 and 154 are transmitted in each VBI line. The 2X format can be used to transmit DN, CSPG, PRI, and VM packets, as shown by data 114 in FIG. 8.

FIG. 11A is a functional block diagram of a television 200 including a VBI slicer 204. The VBI slicer 204 receives an input from a tuner 202. The VBI slicer 204 may include a closed-caption decoder or a closed-caption decoder 206 may be coupled to the VBI slicer 204. The output of the closed-caption decoder is sent to a character generator 210 that generates characters that can be added to the television signal from the tuner 202 in an adder 212 and then displayed on a monitor 214. The VBI slicer 204 can also be coupled to an ad characterization decoder 208.

Instead of locating the VBI decoder in a television, the VBI decoder can be included in a video cassette recorder or other

appliance, or unit of network equipment. FIG. 11B shows an appliance 220 that includes a tuner 222 that feeds a VBI slicer 224, a closed-caption decoder 226, and an ad characterization decoder 227. A character generator 228 is included in the appliance and the output of the character generator 228 is added in adder 232 to the signal that is sent to a television 234. The subject of this invention is to ensure that the VBI slicer and closed-caption decoder, whether located in a television or an appliance, will lock onto VBI line 21 in field 1, so that closed-caption data is not lost, even when the ad characterization vector is being sent in field 2, VBI line 21. Also this invention includes methods for ensuring that the VBI slicer and the closed-caption decoder lock onto the closed-caption data in field 1, VBI 21, even if there is data in adjacent VBI lines in field 1 or field 2.

At the subscriber end, the ad characterization vectors may be utilized to match the advertisements to the subscribers. In one embodiment, wherein the receiving devices, e.g., set-top devices (STBs) have memory storage, e.g., hard drive, the ad characterization vectors may be utilized to selectively download advertisements to the hard drive of the STB. As illustrated in FIG. 12, different advertisements AD1-AD9 are transported in a channel 1201, wherein each advertisement has a corresponding ad characterization vector, e.g., AD1 has ad vector 1, AD2 has ad vector 2, etc. These ad characterization vectors are transported in a separate stream 1203.

A STB hard drive 1205 is configured to decode the ad characterization vector information and to selectively download advertisements from the ad channel 1201. The selection of which advertisements to download may be based on one or more pre-determined parameters, but generally, a correlation function is performed between the information of the ad vectors and the information stored in the STB hard drive 1205. The STB hard

drive 1205 may be configured to store subscriber profiles, e.g., demographic information and/or psychographic information related to the subscriber. If there is enough correlation between the subscriber related information and the ad characterization vector, the corresponding advertisement may be downloaded in the STB hard drive 1205 for later display to the subscriber.

In an alternate embodiment, the ad characterization vector is decoded at the head-end or at another point in the network outside of the subscriber residence. This embodiment has the advantage that the ad characterization information can be stored outside of the subscribers residence and that subscriber grouping and ad matching techniques can be used at the head-end or other locations in the network.

FIG. 13 illustrates an alternative implementation wherein the ad characterization vectors are utilized to dynamically substitute default advertisements with more targeted advertisements. As shown in FIG. 13, based on the information from the ad vectors, AD1 from the program stream 1301 may be substituted with AD11 of the program stream 1303. Once again, the ad substitution decisions may be based on the correlation of the subscriber information to the information stored in the ad vectors.

FIG. 13 also illustrates how the targeted advertisements stored in a STB hard drive 1305 may be used to substitute the default advertisements (the advertisements based on linked sponsorship) e.g., AD13 of program stream 1303 is substituted with one of the targeted advertisements stored in STB hard drive 1305. This substitution results in the display of targeted advertisements to the subscribers. These targeted advertisements are more suited to the subscriber needs/preferences and thus have a higher probability of success than prior art linked sponsorship advertisements.

The principles of the present invention are applicable in a plurality of broadcast environments including over-the-air programming, cable-based systems, satellite-based systems, and streaming video based systems.

Although this invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made which clearly fall within the scope of the invention.

Claims

What is claimed is:

1. A method for characterizing advertisements and transporting an ad characterization in a broadcast television environment, the method comprising:

creating one or more ad characterization vectors, each ad characterization vector comprising key information about the corresponding advertisement; and

transporting the ad characterization vector, whereby the ad characterization vector is received and decoded by receiving equipment.

2. The method of claim 1, wherein the receiving equipment is a set-top device.

3. The method of claim 1, wherein the receiving equipment is network equipment located upstream from a residence.

4. The method of claim 1, wherein the receiving equipment is a cable-ready television.

5. The method of claim 1, wherein the ad characterization vector includes a duration of the corresponding advertisement.

6. The method of claim 1, wherein the ad characterization vector includes a bandwidth requirement for the corresponding advertisement.

7. The method of claim 1, wherein the ad characterization vector includes target audience information for the corresponding advertisement.

8. The method of claim 1, wherein the ad characterization vector is transported as an additional data service in a MPEG layer.

9. The method of claim 7, wherein the ad characterization vector is an elementary stream in the MPEG layer.

10. The method of claim 7, wherein the ad characterization vector is a data stream.

11. The method of claim 7, wherein the ad characterization vector is statistically multiplexed with other audio and video services of the MPEG layer.

12. The method of claim 7, wherein the ad characterization vector is generated by an external encoder and is later synchronized by a clocking device.

13. The method of claim 11, wherein the clocking device is a program clock reference.

14. The method of claim 11, wherein the clocking device is a stand-alone clock.

15. The method of claim 7, wherein the ad characterization vector is a packetized elementary stream.

16. The method of claim 14, wherein the packetized elementary stream associated with the ad characterization vector has a unique packet identification code (PID).

17. The method of claim 15, wherein the packetized elementary stream associated with the ad characterization vector are specified in a program association table (PAT).

18. The method of claim 15, wherein the packetized elementary stream associated with the ad characterization vector are specified in a conditional access table (CAT).

19. The method of claim 1, wherein said transporting the ad characterization vector includes inserting the ad characterization vector in a vertical blanking interval (VBI).

20. The method of claim 18, wherein the ad characterization vector is inserted in one data line of the vertical blanking interval.

21. The method of claim 19, wherein the data line is between line 1 and line 21.

22. The method of claim 20, wherein the ad characterization vector is inserted at a field 2 of line 21.

23. The method of claim 18, wherein said inserting the ad characterization vector includes inserting the ad characterization vector in a copy of the master programming.

24. The method of claim 18, wherein said inserting the ad characterization vector includes inserting the ad characterization vector via a VBI encoder.

25. The method of claim 1, further comprising utilizing the ad characterization vector to match advertisements to subscribers.

26. The method of claim 24, wherein the advertisements are matched to the subscribers in real-time.

27. The method of claim 24, further comprising selectively downloading the advertisements to a set-top device.

28. The method of claim 26, wherein the downloaded advertisements are subsequently inserted in program streams.

29. The method of claim 24, wherein the ad characterization vectors are used to substitute default advertisements with targeted advertisements selected based on subscriber likes/preferences.

30. The method of claim 28, wherein the ad substitution is performed in real-time.

31. The method of claim 1, wherein the broadcast television environment including over-the-air programming, cable-based networks, satellite-based networks, switched-video based network and streaming video based networks.

32. In a broadcast television environment, a system for generating and transporting one or more ad characterization vectors, the ad characterization vectors representing the key information about the advertisements, the broadcast television environment including over-the-air programming, cable-based

systems, satellite-based systems, switched-video based systems, and streaming video based networks, the system comprising:

an ad characterization vector generator for generating one or more ad characterization vectors;

a processor for processing the ad characterization vectors; and

a transport medium for transporting the ad characterization vector along with actual audio and video contents of an advertisement, whereby the ad characterization vector is received by receiving equipment along with the advertisement.

33. The system of claim 30, wherein the ad characterization vector includes duration of the advertisement.

34. The system of claim 30, wherein the ad characterization vector includes required minimum bandwidth for the advertisement.

35. The system of claim 30, wherein the ad characterization vector includes target audience information for the advertisement.

36. The system of claim 30, wherein the receiving equipment is a set-top device.

37. The system of claim 30, wherein the receiving equipment is network equipment located upstream from a residence.

38. The system of claim 30, wherein the receiving equipment is a cable-ready television.

39. The system of claim 30, wherein the transport medium is an MPEG transport layer.

40. The system of claim 36, further comprising a multiplexer for multiplexing the contents of the ad characterization vector with the actual audio and video contents of the advertisement.

41. The system of claim 37, further comprising a clocking device for synchronizing the contents of the ad characterization vector with the actual audio and video contents.

42. The system of claim 36, wherein the ad characterization vector is transported as an additional data service.

43. The system of claim 39, wherein the ad characterization vector is a packetized elementary stream.

44. The system of claim 40, wherein the data packets associated with the ad characterization vector have a unique packet identification code (PID).

45. The system of claim 41, wherein the data packets associated with the ad characterization vector are specified in a (Program Association Table) PAT.

46. The system of claim 41, wherein the data packets associated with the ad characterization vector are specified in a (Conditional Access Table) CAT.

47. The system of claim 30, wherein the transport medium is a vertical blanking interval (VBI).

48. The system of claim 44, further comprising a key inserter for inserting the ad characterization data in the VBI.

49. The system of claim 44, wherein the ad characterization vector is inserted in one data line of the VBI.

50. The system of claim 46, wherein the ad characterization vector is inserted at a field 2 of line 21.

51. The system of claim 30, further comprising a decoder for decoding the ad characterization vector.

52. The system of claim 48, wherein the decoded ad characterization vector is used to match advertisements to subscribers.

53. The system of claim 49, wherein the advertisements are matched to the subscribers in real-time.

54. The system of claim 49, wherein the advertisements are selectively downloaded to a set-top device.

55. The system of claim 51, wherein the downloaded advertisements are subsequently inserted in program streams.

56. The method of claim 49, wherein the ad characterization vectors are used to substitute default advertisements with targeted advertisements selected based on subscriber likes/preferences.

57. The system of claim 30, wherein the broadcast television environment including over-the-air programming, cable-based systems, satellite-based systems, switched-video based systems, and streaming video based networks

Abstract of the Disclosure

An apparatus and a method for creating one or more ad characterization vectors and for transporting the ad characterization vectors. Each ad characterization vector characterizes a corresponding advertisement and may include essential information such as: duration of the advertisement, bandwidth requirements of the advertisement, target audience, etc. The ad characterization vector may be transported within an MPEG layer as a separate data service. Herein, the ad characterization vector is encoded along with program audio and video contents and travels within a single MPEG transport layer. Alternatively, the ad characterization vector may be transported within the vertical blanking interval along with closed-captioning data. The ad characterization vector may be decoded by a decoding device, e.g., a set-top device, and may be utilized to determine which advertisements are suitable for that subscriber. The ad characterization vector may also be used by the set-top device to selectively download advertisements. These advertisements may be later inserted in program streams for display to the subscriber. Alternatively, information from the ad characterization vectors may be used to dynamically substitute advertisements in the program streams.